

## ARE WE HUMAN OR ARE WE DANCER? – AI CREATIVITY IN THE REALM OF XR

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### **Abstract**

As an emerging field of research, the intersection of AI and XR is expanding in front of us as unexplored topologies of meaning. The field of extended reality, still stumbling in the periphery of the cultural semiosphere, is becoming increasingly connected to the very central today exponential growth of artificial intelligence. This paper explores the nature of this intersection and brings forward arguments for tackling the understudied questions of its social and artistic impact. Most studies currently examine the application of AI tools within the context of XR, not the other way around. Their focus is on collecting and analyzing data regarding the speed and effectiveness of creating realistic XR worlds, the user experience

in its performance-driven aspects, interactivity and gestural locomotion techniques, as well as perceptual experiments based on studies of virtual assistants. This indicates a gap of research papers addressing the topic of AI's impact on the cultural and social mechanics of XR.

This paper bases its findings and proposals on several research papers conducted on the topic of social and artistic impact. These include for example “Extended Reality and Artificial Intelligence’s Ethical Crossroads: From Sensory Manipulation to Creative Disruption” and George Mason University studies on “Automatic Generation of VR Scenarios and XR Experiences”, as well as XR productions created by leading artists and studios in the field.

On the one hand, the aim is to articulate a discussion on the upcoming changes in the field of artistic practices as a result of the introduction of AI toolkits, while on the other, to contextualize the use of artificial intelligence in the realm of XR’s potentialities for new types of networking.

**Keywords:** virtual reality, artificial intelligence, extended reality, immersive media, digital culture, the cultural explosion of AI

At present, the majority of scholarly inquiry at the intersection of artificial intelligence (AI) and extended reality (XR) is predominantly directed towards the application of AI technologies as instrumental tools for optimizing XR production pipelines. This body of research tends to emphasize computational efficiency, focusing on the acceleration and automation of XR content creation, as well as the enhancement of user experiences through performance-driven metrics. Typical studies in this domain analyze aspects such as the generation of realistic virtual environments (Slater & Sanchez-Vives 2016), the refinement of gestural and locomotion interfaces, and the development of responsive virtual assistants capable of simulating naturalistic human interaction. While these areas represent important technological advancements, they are frequently grounded in utilitarian and engineering-oriented paradigms which prioritize functionality, realism, and immersion rather than the artistic or sociocultural potentials. The integration of Artificial Intelligence with Extended Reality technologies marks a significant cultural threshold where enhanced environments move beyond mere technological advancement, ushering into new modes of perception, creation, and interaction. As AI begins to inhabit and animate XR architectures with agency, learning and improvisation, the immersive spaces become more performative, volatile, and participatory. This article argues that the role of AI in XR is not simply instrumental but inherently transformative (Floridi 2014). It calls for critical engagement with

how AI reshapes cultural and social meaning-making within XR platforms. The text proposes a shift in the research focus, from AI as a toolkit within XR to a co-constituent of cultural logic.

A central dimension of this contemporary convergence lies in the ability of AI systems to furnish XR with implicit environmental and situational functionalities. Algorithms are increasingly employed to autonomously generate visual elements, animations, and even entire virtual environments. AI plays a pivotal role in addressing XR content production challenges. Generative AI tools now facilitate the rapid creation of 3D models, all types of environments and code, thus significantly reducing the time and financial resources required to develop XR experiences: a barrier too high for most small and middle sized production companies. Platforms such as Meta's Horizon Worlds integrate AI-driven procedural generation allowing entire virtual worlds to be built through text prompts, while specialized services like Meshy, HunYuan, and Suno automate asset generation. Coding assistants such as Claude Code further streamline software development. These innovations democratize XR creation, enabling broader participation and accelerated experimentation. These systems produce dynamic artworks which evolve in real time in response to user interaction or external inputs, thus leading to the emergence of participatory experiences in which the viewer's agency becomes central to the unfolding of the artwork.

Beyond the visual, AI is also employed in the generation of music and soundscapes where the coupling of generative sound with immersive media heightens affective engagement, and further dissolves the boundary between spectator and artwork. By analyzing behavioral data and user preferences, these systems can tailor immersive experiences with adaptive context in which avatars change reactions, tone, behavior and the overall emotional vibration of a story. This level of adaptation challenges the one-size-fits-all paradigm of traditional media and points toward an aesthetic of relational and contingent art. A slightly different case is represented by smartglasses, which when equipped with cameras, microphones, and other sensors, enable continuous spatial awareness without explicit user input. This capability allows AI to respond dynamically to the surrounding environment. Such seamless contextual interaction is augmented by XR's hands-free affordances which are particularly suited to tasks requiring simultaneous physical and cognitive engagement.

Despite these benefits, generative AI and its speedy ready-made solutions introduce a series of incongruences. On one hand, the main question it raises among career artists is not as much related to the already common discussion on non-linear narratives. It rather points to the "answer instead

of process” nature of AI and the extent to which it predisposes for an authentic artistic act which can lead to a product with a deeper socio-cultural value (McCormack, Gifford, and Hutchings 2019). It raises the question of whether the algorithm deprives us of all the mistakes and hardships of the creative process which ultimately lead to an “artistic discovery”, and a genuinely authentic work relatable in the human sense. On the other hand, the ease of production often results in an abundance of low-quality homogenous “AI slops” exacerbated by insufficient content curation. Current AI-generated assets frequently exhibit technical limitations such as imperfect mesh topologies, inconsistent visual styles, and the recognizable “AI-generated” aesthetic. This can diminish cohesion and the overall feeling of humanness of the experience. This issue reflects some of the main concerns raised by Kate Crawford and Trevor Paglen regarding the cultural construction of training data in AI systems (Trevor & Paglen 2021). This mode of production risks eroding the sense of craftsmanship otherwise historically associated with artisanal XR worldbuilding.

While AI expedites development, its outputs may lack the emotional depth and narrative richness achieved through classical human creativity. Traditionally perceived as abstract in the sense of manifesting only as text or disembodied voices, AI agents in XR can be spatially and visually integrated into the perceptual fields of users. Augmented reality interfaces enable AI assistants to deliver information through overlays, spatial cues, or anthropomorphic avatars, thus deepening engagement and facilitating the intelligibility of the process. This physicalization strengthens the relational dimension of AI by embedding it within interactive, socially intuitive contexts. Assuming the role of a storyteller and an improviser, AI starts moving beyond fixed logic trees and increasingly improves narrative arcs in real time immersive spaces. These generative systems respond to user inputs and environmental contexts thus creating bespoke trajectories and they become a dramaturgical agent which shapes affect and tension in ways previously limited to human authorship. Neural networks and generative models enable hybrid art forms in XR which are co-produced by artist and algorithms. This artistic disruption signals a move toward emergent forms of authorship and speculative aesthetics that challenge conventional notions of originality. “Extended Reality and Artificial Intelligence’s Ethical Crossroads: From Sensory Manipulation to Creative Disruption” (Jorge & Hürst 2024), a round-table based research paper, explores the ethical, social, and creative implications arising at the intersection of Artificial Intelligence and Extended Reality. Through expert contributions from leading figures in immersive media, AI research, and human-computer interac-

tion, the discussion presents a critical analysis of the rapidly evolving AI-XR ecosystems. Central to its argument is the necessity of human agency, ethical safeguards, and artistic integrity amidst the growing influence of generative and predictive AI systems in immersive media. A primary conclusion is that while AI holds immense promise for the automation and personalization of XR content, such as worldbuilding, character generation, and real-time behavioral adaptation, it simultaneously introduces a range of ethical risks. These include exploitation of creative labor, privacy violations through biometric data harvesting and the erosion of trust through data contamination and misinformation. The artist, Jacquelyn Ford Morie, for example, warns of the dangers of “data poisoning”, wherein AI-generated hallucinations feed back into training data, resulting in degraded system reliability. She advocates copyright protection, artwork tagging, and artist compensation as key steps toward reestablishing creative trust. She claims AI in XR must be transparent, accountable, and respectful of human creators. Compensation and recognition for artists and data contributors are not only ethical but necessary for sustaining trust. Andrew Glassner echoes these concerns, arguing that AI systems often operate as opaque “black boxes” lacking transparency and accountability. He contends that while AI can simulate plausible narratives and visuals, it cannot genuinely reflect the richness of human lived experience. Without clear provenance and validation mechanisms, the data which underpins AI training remain susceptible to manipulation, bias, and corporate control. Thus, they ultimately affect how reality is perceived and shaped in XR environments. Glassner is especially critical of the unchecked power which AI developers wield over perceptual infrastructures, warning that this could lead to subtle yet profound manipulation of public understanding through XR-mediated experiences. Nuria Oliver outlines the structural challenges of building reliable AI systems for XR, highlighting the enormous demands of data volume, annotation, latency, and environmental impact. She also emphasizes the lack of consensus over ethical alignment in AI training, a problem which undermines inclusivity and user trust. She suggests that the merging of classical symbolic AI with contemporary machine learning could yield more transparent and explainable systems, although scalability remains an open challenge. She also claims that hybrid models combining symbolic and statistical AI could help address explainability and value alignment, enabling more nuanced and human-centered XR systems. Mark Billinghurst points to both risk and opportunity in AI-enhanced XR. On the one hand, sensor data used for intuitive interaction, such as head movement or gaze, can jeopardize user privacy when misused. On the other, such data,

when responsibly managed, can enable more empathetic virtual agents and adaptive environments. He sees potential in AI-driven cultural translation and matchmaking systems which enhance social XR experiences by aligning gestures, language, and context across global users.

Recent advancements at the intersection of artificial intelligence, extended reality, and computational design are exemplified by the work of Professor Craig Yu and his research group at George Mason University (Yu 2024). Their work represents a multidimensional approach to the automatic generation of XR scenarios emphasizing both algorithmic innovation and user-centric interactivity. Operating under the banner of the Design Computing and Extended Reality (DCXR) Lab, the group explores how generative models and machine learning can be embedded within immersive environments, in order to enable adaptive, intelligent, and context-sensitive experiences. Yu's team engages with XR across several domains, notably including generative storytelling, personalized training, robot teleoperation, computational interior design, and interactive agent systems. Central to their methodology is the transformation of traditional manual design tasks into computational optimization problems. These problems are mathematically formulated to define large-scale design spaces, enabling algorithmic agents to explore multiple high-quality solutions which human designers might otherwise overlook. For example, their early work on interior design automation demonstrated how optimization could generate thousands of viable room layouts by learning spatial patterns from existing examples and applying constraints such as circulation paths. A particularly innovative area of their research focuses on personalized XR training environments. By leveraging the data-rich nature of virtual environments such as gaze tracking, gesture analysis, and performance logging, Yu's team creates adaptive training modules for skills like driving and wheelchair navigation. These systems are driven by AI optimizers that evaluate user behavior and dynamically generate task scenarios tailored to observed weaknesses. For instance, if a user demonstrates difficulty in executing turns while driving, the system generates iterative scenarios that emphasize turning maneuvers thus improving skill retention through repetition and contextual variation. Similarly, in the domain of computational interaction the team formulates user-tool interactions as quantifiable events. Using machine learning classifiers, they have developed adaptive assistance systems that respond to inferred cognitive states, such as confusion by offering context-aware support only when necessary. This model of "just-in-time" interactivity illustrates a shift toward emotionally and cognitively responsive XR environments.

The lab also explores mixed reality storytelling through augmented reality. Yu's AR storytelling engine dynamically populates physical environments with virtual characters and narrative sequences which adapt to the semantic structure of the physical space. This involves photogrammetric scans of the environment, object segmentation via computer vision, and story adaptation through optimization frameworks. The result is a contextually coherent narrative mapped to a user's real-world surroundings. With the integration of large language models such as ChatGPT, the system can even generate narratives in real-time, moving beyond predefined scripts toward emergent AI-driven storytelling.

An extension of this work includes life-like virtual agents and animal companions. For example, the team developed a data-driven virtual cat whose behavior is modeled on real-world observations, with actions determined by AI optimizers. Additionally, the group has scaled their AR experiences to outdoor settings, exemplified by a project involving a virtual dragon navigating real-world spaces based on user annotations and terrain classifications. Through this body of work, Yu's group demonstrates in practice a significant shift in the role of AI in XR, namely from a toolkit used to simulate or assist, to a generative agent which co-constructs environments, narratives, and user experiences. Their research reconfigures traditional boundaries between user and system, artist and tool, environment and narrative. The implications are twofold. On the one hand, AI becomes a co-author of virtual experience, while on the other, XR becomes not only a domain of technological display but also a field of epistemological transformation, where computational systems participate in the creation of meaning, agency, and sense-making.



Refik Anadol  
Unsupervised - Machine Hallucinations,  
2016, Exhibited at MoMa, 2023

<https://refikanadol.com/works/unsupervised/>



Refik Anadol

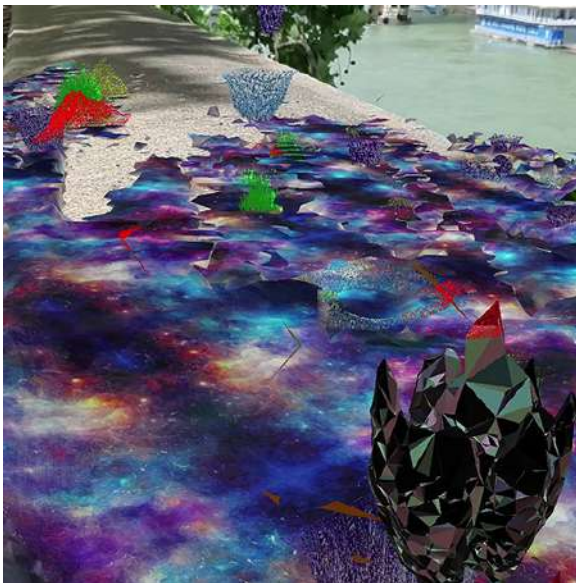
Unsupervised - Machine Hallucinations, 2016

Exhibited at Artechouse, New York, 2019

<https://refikanadol.com/works/machine-hallucination/>

Various creative organizations and artists, albeit still few in number, are exploring the creative potential in this still artistically unclear field. *An intriguing example* is “Unsupervised (2022)”. This project is a prominent generative artwork within the larger framework of Refik Anadol Studio’s “Machine Hallucinations” project. It exemplifies a critical convergence between artificial intelligence and extended reality as modes of artistic expression. Drawing on vast datasets and unsupervised machine learning models, the work leverages AI not simply as a computational tool, but as an active co-creator capable of forming new visual languages. The conceptual architecture hinges on the use of scale visual datasets, most notably the entire collection of The Museum of Modern Art (MoMA) in New York. Through unsupervised learning, the algorithm identifies latent patterns and correlations in this archive without human-labeled categories, ultimately generating new visual compositions. These synthetic forms are not mere reproductions but constitute a speculative visual history generated through the machine’s internal logic. In this sense, “Unsupervised” offers a “hallucinatory” reading of art history, filtered through the perceptual processes of AI. What distinguishes it within the domain of immersive media is its deployment within immersive frameworks. The project has been exhibited in large-scale LED installations and spatialized environments effectively translating the machine’s latent space into an embodied sensorial experience for the audience. The use of XR in this context is not ancillary but integral, since it allows the viewer to “step into” the operational logic of the AI system, navigating a space that is continuously reconfigured in real

time. The result is an aesthetic encounter which is neither fully authored by the human nor wholly autonomous in its machine generation. Rather it emerges from a complex feedback loop between algorithmic agency, spatial computing, and embodied perception. In this synthetic ecology, data, code and perception are entangled in the production of new aesthetic realities thus signifying an emerging ontological shift from spectatorship to co-presence within the artwork's algorithmic world. The humans are invited to witness from within the "dance" of the machine. This logic is reversed in the artwork "Objects (RE) Oriented" by Chiara Passa exhibited at HKUST Guangzhou "SURREALITY" exhibition in 2025. This is an interactive XR installation which investigates the boundaries between tangible materiality and digitally mediated environments. Viewers are invited to interact with the installation by tapping directly on their device screens, overlaid on 3D mesh surfaces visible through augmented reality. Each interaction generates and places within the environment a randomized piece of 3D "debris" drawn from a custom-built and continually expanding database of digital assets. These debris forms were initially created using artificial intelligence and curated from generative workflows and datasets developed specifically for the project. The audience can scale, rotate, translate, recolor, and reposition them in the augmented environment. This feature encourages



Chiara Passa

Objects (RE) Oriented Debris, 2024

Exhibited at Center for Metaverse and Computational Creativity (MC2), Guangzhou, 2025

<https://www.chiarapassa.it/artworks-2016-2026.html>



Chiara Passa  
Objects (RE) Oriented Debris, 2024  
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compositional agency, allowing participants to co-construct a new spatial topology. Each debris item is also sonically augmented and emits space-related ambient sound extracted from public archives of the European Space Agency (ESA). Complementing the virtual layer, the installation incorporates real-world sculptures placed within the exhibition space. These sculptures are embedded with Near Field Communication (NFC) tags, enabling visitors to trigger additional content upon physical proximity. By scanning the sculpture, viewers reveal internal animated sequences, thus extending the artwork's hybrid dramaturgy into the interior architecture of physical objects. The technology here is not leading us, but rather moving along and reacting, provoking and stimulating. It is vibration between the physical and the virtual within which meanings and aesthetics conquer new cultural territories.

In the abovementioned examples XR and AI are very clearly positioned both as tools as well as co-constituents. They do not substitute processes or imitate artistry. On this technological intersection, Rossa and Anadolu manage to curate experiences which invite the spectators into a new dance of meaning making. Audiences are not dehumanized but rather enabled to explore and form new opinions on the state of digital art today. Both works create new social spaces rather than isolating or disconnecting the viewers. They manage to continue the tradition of shared cultural rituals, whilst, in the same time, expanding the contemporary definitions of artistic experiences. The discussion on our rapidly evolving technological frame is thus

enabled to maintain an active and critically vivid interconnection between the physical, the intellectual and the emotional.



Still frame from *We Met in Virtual Reality* (2022), illustrating avatar-based social interaction within the VRChat platform.

<https://www.imdb.com/title/tt16378482/>

Social platforms are another realm which gives numerous examples of how human interconnection expands throughout the digital realm. Artificial Intelligence is increasingly integrated into applications like VRChat, transforming them from a user-driven virtual worlds into emerging platforms for AI-mediated interaction, avatar autonomy, and social experimentation. One key implementation involves the use of Open Sound Control (OSC) in conjunction with the Model Context Protocol (MCP), allowing AI assistants such as Claude to control avatar behavior in real-time. These assistants can manipulate expressions, movement, gaze, and even generate dialogue through external language models, making avatars semi-autonomous participants in social environments. In addition, VRChat's SDK now supports AI Navigation, which enables Non-Player Characters (NPCs) to traverse virtual spaces using Unity's NavMesh system. NPCs can dynamically avoid obstacles, perform contextual actions, such as jumping, and exhibit basic intelligent pathfinding, although some advanced features remain limited. A growing subculture also explores large language model-driven avatars, like the AI character "Celeste", which uses LLMs for text-based interaction and basic spatial awareness, albeit with limited emotional nuance and realism. Beyond entertainment, AI is being explored for real-time moderation. One example is the "Safe Guard" system which can detect hate speech in VRChat's voice chats, contributing to community safety and platform governance. Meanwhile, in creator communities, such

as VRChat Discord, generative AI tools are used to produce world assets, avatar models, and immersive scripts, sparking debates around authorship, ethics, and cultural authenticity. Collectively, these developments reveal a shift in XR practice, namely from AI as a mere toolkit to a co-constituent in the construction of meaning, behavior, and interaction in synthetic social spaces. A compelling illustration of the phenomenon of such digitally mediated social relationships is presented in the film “We Met in Virtual Reality” (Hunting 2022), which documents a series of personal encounters entirely filmed within VRChat. The film reveals how interactions initiated in virtual space can evolve into meaningful, emotionally resonant relationships in physical life, without either dimension negating the other. This interplay suggests a significant point of convergence between the social and the virtual, highlighting a cultural condition wherein self-referential signs and simulated presences are not merely tools of communication, but constituents of perceived reality. We inhabit a world where such signs, embedded within technological infrastructures and mediatized culture, are affecting not only modes of use, but also the very epistemic status of perception and truth. On one hand, this engenders a sense of technological acceleration and control, and on the other, it opens up novel, uncharted horizons of experience. (Baudrillard 1994).

In this context, the field of AI and XR art occupies a critical position. It not only facilitates the materialization of new social and cultural formations, but also engenders novel affective realities between users. Rather than serving as a simulation or virtual environments, it contributes to the speculative conditions through which meaning, agency, and authorship are negotiated. Today the intersection of AI and XR is beginning to co-produce logics of immersion, co-determine protocols of interactivity, and transform the ontological status of the “virtual” itself. As such its role is not solely technical, but from critical and theoretical perspective has an impact on perception, cognition, and the cultural construction of reality today.

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### **Filmography**

*We Met in Virtual Reality*, directed by Joe Hunting J. USA: Cinetic Media, 21 January 2022.